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# **Multinational enterprises, foreign direct investment and trade in China**

## **A cointegration and Granger-causality approach**

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# **Multinational enterprises, foreign direct investment and trade in China**

## **A cointegration and Granger-causality approach**

### **Abstract**

Multinational enterprises (MNEs) play a dominant role in the international business (IB) literature. Traditionally, by far the majority of IB studies deal with issues at the micro level of the individual MNE, or at the meso level of a sample of individual MNEs. This paper focuses on a macro-level issue: the impact of MNE behavior through foreign direct investment (FDI) on international trade, and *vice versa*. In so doing, this study responds to a recent plea for more macro-level studies in IB into the effect of MNE behavior on the macroeconomic performance of countries as a whole, particularly developing and emerging economies. In this way, IB research would inform the heated debate about the pros and cons of globalization, where anti-globalization rhetoric emphasizes the negative consequences of the increased dominance of MNEs for the world at large and the Third World in particular. In the current study, we focus on the largest developing or emerging economy of all: China. Applying sophisticated econometric techniques, we unravel the causality and direction of FDI – trade linkages for the Chinese economy in the 1980 – 2003 period.

# Introduction

Recently, Meyer (2004) and Ramamurti (2004) convincingly argued that IB research should partially be redirected to macro-level issues so as to inform opinion and policy-makers about the role of multinational enterprises (MNEs) in the world economy, particularly by linking rich and poor economies. After all, as Meyer (2004: 259) rightly points out, IB studies can help to deepen “our understanding in how foreign direct investment (FDI) influences economic development and national welfare.” In the policy domain, this is a controversial issue indeed. On the one hand, traditional economic theory, as advocated by the IMF, would suggest that the role of MNEs and FDI is, by and large, positive. On the other hand, popular anti-globalization rhetoric claims that the modern MNE threatens the world, as is so thought-provokingly argued by such figureheads like Noreeta Hertz (2001) and Naomi Klein (2001).

Academically, to date this debate has been dominated by non-IB scholars, particularly economists (Buckley and Casson, 2003). The present paper is an attempt to offer an IB-inspired contribution. Following Meyer’s (2004) and Ramamurti’s (2004) lead, we deal with the societal effect of FDI in a developing and emerging economy. In effect, we focus on the largest developing or emerging economy of all: China. Applying sophisticated econometric techniques, we unravel the causality and direction of FDI – trade linkages for the Chinese economy in the 1980 – 2003 period. In so doing, we of course limit our attention to one specific potential macro-effect of FDI – as a potential determinant of the host country’s export and import. Hence, our study is complementary to the majority of macro-oriented IB studies, which tend to focus on the impact of FDI on technology (productivity) spillovers (e.g., Hejazi and

Safarian, 1999; Liu, Siller, Wang and Wei, 2000; Feinberg and Majumdar, 2001; Buckley, Clegg and Wang, 2002; Chung, Mitchell and Yeung, 2003).

An important exception to this dominant attention to the issue of technology linkages is Brouthers, Werner and Wilkinson (1996). They study the impact of MNEs' FDI on the balance of payment in developed and developing countries. Their key argument is that this impact will differ with the dominant underlying MNE motives as to why to engage in FDI in the first place. On the one hand, MNEs tend to invest in developed countries for reasons of market access, triggering increased imports. On the other hand, FDI in developing countries is likely to be predominantly motivated by a search for resource advantages, leading to increased exports. As a result, the aggregate impact of FDI on the trade balance will be negative in developed countries, but positive in developing economies. Brouthers, Werner and Wilkinson (1996) produced cross-section evidence for this logic with a wide set of countries in 1988 – 1991. For China, for instance, they report a positive effect of inward FDI on the trade balance.

The current study offers a threefold contribution to the literature. First, following Brouthers, Werner and Wilkinson's (1996: 369) suggestion, we study FDI – trade linkages in a longitudinal context, analyzing data for the 1980 – 2003 period. Second, related to this, we investigate causality issues by applying sophisticated econometric techniques – i.e., Granger-causality and cointegration approaches. Third, in so doing, we seek to deepen our understanding of a key aspect of the societal effect of MNE behavior: FDI's impact on trade. In the next section, we start by introducing background information about China's FDI and trade. Next, we offer a brief review of the relevant literature. Subsequently, we discuss our methodology. After that, we present the evidence. Finally, we conclude with an appraisal.

## FDI and trade in China

After the victory of communism in China, the Chinese economy was for many decades an isolated black box in the world economy. In the post-Mao decades, however, China's bilateral trade linkages with the rest of the world have intensified impressively. The growth of China's trade since 1978 has been four and a half times that of world trade, as is visualized in Figure 1, which transformed China from a closed economy to one of the largest trading countries in the world.

[INSERT FIGURE 1 ABOUT HERE]

China's share of world trade septupled from 0.67 percent on the eve of reform in 1977 to 4.89 percent in 2002 (Source: IMF DOTS databank). In the post-war period, no other country has increased its share in international trade so rapidly. At the same time, China has become more and more open to FDI, even more so than most other developing countries. As a consequence, China's inward FDI increased from nearly zero in 1978 to the largest FDI-recipient in the developing world in the 21<sup>th</sup> century.

Zhang and Van Witteloostuijn (2004) report that, after two decades of economic reform, the economic elements started to play their role as drivers of bilateral trade linkages much more prominently in the 1990s and early 21<sup>th</sup> century, pushing the 'Maoist' role of political affinities to the background. Among the economic elements, FDI is a central variable that gained prominence in recent decades as a key determinant of bilateral trade intensities. Indeed, the official statistics suggest that FDI by multinational enterprises (MNEs) has played an increasingly dominant role in the domain of China's trade with the outside world. An important and often-used piece of evidence about the impact of FDI on China's trade is the share of MNEs in total Chinese export and import. As Figure 2 demonstrates, the shares of so-called Foreign Invested Enterprises (FIEs) in total national export and

import flows have increased considerably since China's liberalization program became effective, increasing from 1.9 and 5.6 per cent in 1986 to 54.8 and 56.2 per cent in 2003.

[INSERT FIGURE 2 ABOUT HERE]

These figures seem to imply that FDI has underpinned China's trade expansion. However, the share of FIEs in total national exports and imports is a very crude indication of the impact of FDI on trade. One reason for this is that the category of FIEs does not only include wholly-owned foreign enterprises, but also joint ventures with shared ownership by both Chinese and foreign investors in which the foreign investors' capital contribution should not be less than 25 per cent of the total registered capital.<sup>1</sup> Therefore, domestic investments also contribute to the FIEs' exports and imports. Furthermore, an important part of FDI's influence on their host countries' trade may follow an indirect path. For example, through spillover effects, FDI can affect the export and import performance of local firms, and hence the total export and import flows in host countries. For these reasons, simply taking the official statistics at face value provides far from sufficient evidence – if any – as to the explanation of the FDI – trade linkages. A more sophisticated and appropriate technique is needed to uncover the effects that underlie the official figures.

The present paper will seek to detect whether or not one or two-way casual FDI – trade (i.e., export and import) linkages can be uncovered by analyzing time series data for the 1980 – 2003 period, so covering the epoch of dramatic change. We investigate both long-run and short-run relationships between FDI on the one hand and exports and imports on the other hand by using Granger-causality and cointegration approaches. Before doing that, though, we will first briefly review the relevant literature on FDI and trade.

# Literature

## International economics and international business

From decades of research, it is clear that FDI and trade are closely interrelated. MNE activity has a distinctive effect on the trade structure of both home and host countries because of the MNEs' ability and willingness to internalize cross-border transactions, thereby affecting the value-added activities both within a country and between countries (Dunning, 1992). By and large, the international business (IB) and international economics (IE) literatures are unanimous on the importance of this link. However, the exact nature of the relationships between FDI and trade is a controversial issue, because (a) causalities can run both ways, from FDI to trade and from trade to FDI, and (b) the sign of any FDI – trade linkage is dependent upon the underlying MNE strategies.

The mainstream in the classic theory of international trade in IE views the mobility of goods and factors as opposing forces. As part of international integration processes, trade in goods leads to the convergence of product prices, and thus of factor rewards; alternatively, migration or FDI triggers a convergence of factor rewards, and hence of product prices. This is the so-called Mundell principle. The well-known Heckscher-Ohlin-Samuelson-Mundell framework suggests that international trade of goods can substitute for international movement of factors of production, which includes FDI. Similarly, the other way around, international factor mobility, including FDI, may substitute for trade in goods. In Mundell's words, "Commodity movements are at least to some extent a substitute for factor movements ... an increase in trade impediments stimulates factor movements and ... an increase in restrictions to factor movements stimulates trade" (Mundell, 1957: 320).



Vernon (1966) developed the product-cycle IE model of internationalization to explain the sequence from domestic production of a new product to its export and then foreign production by investigating the US multinational companies in 1950s and early 1960s. According to the model, in the first stage, new products initially are developed in the US, and sales occur first in the domestic market. Subsequently, in the second stage, export will start developing to those foreign markets where the consumers have the same preferences and incomes as at home. As the foreign markets grow, in the third stage, US firms might establish a subsidiary abroad to produce their products closer to their destination markets. When the production in foreign countries rises, US export to those markets will fall, as well as that to third-country markets. Finally, in the fourth stage, as foreign firms master the production processes and as their costs fall with the increased scale of production, they might begin to export their products to the US. This developmental sequence indicates that foreign production may substitute for export from the home country, even creating import of the same product in a later stage. From the perspective of a host country, conversely, FDI is replacing its imports first and increasing its exports later.

From a macroeconomic point of view, Kojima (1975 & 1982) points out that the comparative advantage of industries in home and host countries is crucial in determining whether FDI is trade-oriented or not. Kojima's macroeconomic approach predicts that export-oriented FDI occurs when the source country invests in those industries in which the host country has a comparative advantage. It is beneficial for an investing country if an FDI flow goes abroad from its comparatively disadvantaged marginal industry for the purpose of producing goods in the host country at costs lower than at home through the transfer of efficient technology and management. Subsequently, in the next stage, importing the associated goods back into the home

country (or exporting them to third markets) may gain prominence. Additionally, this kind of FDI benefits the host economy, since it stimulates the export of new products from the host country. Therefore, on the one hand, if an MNE invests in a host country with comparative advantages that compensate for disadvantages in the home country, then FDI will increase the host country's trade. However, on the other hand, if an FDI flow comes from an industry with a comparative advantage in the home country but a disadvantage in the host country, then this FDI tends to be a trade substitute because this investment does not fit with the host country's comparative advantage, which eventually reduces the total output and trade volume of both countries involved. In developing host countries, FDI flowing into labor-intensive industries is likely to be trade-creating, whereas FDI flowing into capital-intensive industries is likely to be trade-replacing or trade-destroying.

A related literature investigates the relation of trade and FDI in the context of development issues. Based on the conceptual framework developed by Porter (1990), Ozawa (1992) formulated a comprehensive theory describing linkages between economic development and competitiveness that create international trade and FDI. Ozawa argues that an increase in trade flows occurs as a result of improved comparative advantage, which is, in turn, influenced by FDI leading to changes in the pattern of this advantage. He offers an explanation of the causal relationships between an outward-oriented economic policy and the impact of FDI on trade by emphasizing the effects of FDI on comparative advantage and structural upgrading in manufacturing. In this line of argument, FDI and international trade are not only increasingly complementary and mutually supportive, but also increasingly inseparable as two sides of the process of economic globalization (Ruggiero, 1996). Furthermore, inward FDI may stimulate exports from domestic sectors through

industrial linkage or spillover effects, especially through backward linkages, buying local-made intermediate inputs to produce exports (O hUallachain, 1984). This effect creates a strong demand stimulus for domestic enterprises, and promotes exports.

The IB literature adds to the traditional IE perspective by opening up the black box of the MNE. For instance, the IB literature emphasizes the role of the motives underlying MNE behavior, including FDI strategies. With a different motivation, FDI has a different effect on trade. Motivations can be classified into two general categories: market-seeking and factor-seeking (Root, 1977 & 1994). Market-seeking FDI follows demand, penetrating foreign markets with a promising sales potential. Market-seeking FDI may have a negative impact on the host country's trade balance, since "the affiliates of foreign firms (in the US) do show an apparent tendency to export somewhat less and import significantly more than US firm – indeed over two and a quarter times as much" (Graham and Krugman, 1989: 67). Factor-seeking FDI includes MNE behavior aimed at gaining access to raw materials and low-cost locations. FDI motivated by the quest for raw materials is used to produce goods with natural resources that are lacking or under-supplied in the home country. In general, this type of FDI increases exports from the host nation to the home country, as well as to other third countries (Root, 1994). FDI motivated by low-cost production objectives takes advantage of low-cost factors, such as cheap labor, as part of an overall global sourcing strategy, leading to an ability to export products from the emerging host nation to other countries in the world, including the MNEs' home countries. In this case, the host country is able to increase exports and improve its trade balance (Phongpaichit, 1990).

So, in the business and economic approaches to FDI, trade is considered to be one of the factors that determine the MNE's choice of location for FDI initiatives. On

the one hand, a high level of imports in host countries suggests a high level of penetration by foreign companies, which may start off by exporting to the host country, to subsequently switch to FDI once they have established a foothold in those countries. Following this logic, a long-run positive relationship is hypothesized between host-country import and inward FDI (Culem, 1988). On the other hand, in the short run, multinational companies may regard export and FDI as alternative modes of foreign market penetration, which implies a negative relationship. Therefore, there is uncertainty as to the net effect of the level of the host country's imports on FDI (Billington, 1999). Of course, an MNE's motivation may be complex, implying that FDI is undertaken for more than one reason. Furthermore, regional economic integration and growth of intra-firm trade complicates the prediction of the trade effect of FDI (Narula, 1996). All this together explains why unconditional hypotheses about the causality and sign of FDI – trade linkages make no sense.

### **FDI, trade and China**

To summarize, the “quick” literature review above indicates that the relationship between the trade and FDI is complicated, implying that the sign and direction of the causal relationship depend on the range and type of trade and FDI being considered, the MNEs' dominant motives and strategies, and the characteristics of the industries and countries involved. Figure 3 summarizes the possible relationships that different pieces of literature predict, where the causalities and signs depend upon the set of conditions under investigation. Obviously, the causal and directional relations between export, import and FDI are not clear-cut, which is why all arrows are associated with question marks.

[INSERT FIGURE 3 ABOUT HERE]

Not surprisingly, then, the empirical evidence is mixed. The majority of the empirical studies have confirmed that outward FDI and exports are complementary, especially in the case of developed countries (e.g. Swedenborg, 1979; Lipsey and Weiss, 1981; Blomstrom, Lipsey and Kulckyck, 1988; Pearce 1990; Pfaffermayr 1996; and Wei, Liu, Parker and Vaidya 1999). An early exception to this rule is Horst (1972), however, who found that trade and FDI reveal a substitutive linkage, and hence are negatively related. Yet other studies have reported that the effects of FDI on exports are different from that on imports. For example, Bayoumi and Lipworth (1997) showed that outward FDI from Japan had only a temporary impact on exports, but a permanent effect on imports.<sup>2</sup>

In terms of Figure 3's FDI – trade relations, China is an interesting case that attracted and still attracts much attention from economists and politicians. Using China's provincial data over the 1985 – 1995 period, Wei, Liu, Parker and Vaidya (1999) revealed that provinces with a higher level of international trade attract more FDI. Using provincial data for 1984 – 1997, Sun (2001) found evidence for a one-way causality from FDI to export in China's coastal and central regions. Using bilateral data for China and 19 trade partners for 1984 to 1998, Liu, Parker, Vaidya and Wei (2001) applied unit-root and Granger-causality tests, indicating that import causes FDI and FDI causes export. Using quarterly data from 1981 to 1997, Liu, Burrridge and Sinclair (2002) investigated the causal links between economic growth, FDI and trade, showing that two-way causal connections exist between economic growth, FDI and export.

Together, these studies reveal important features of the relationships between Chinese FDI and trade. However, these previous studies either use provincial or bilateral data, and only a few studies have investigated the causal linkages between

FDI, export and import at the aggregate level. Moreover, earlier work has not incorporated the influence of policy regime changes into their models, and information for the period after the Asian crisis has not yet been included. The present study's aim is to extend the extant literature by filling these gaps. In total, we explore three possible linkages (cf. Figure 3), both in terms of their size and their causality, given our set of three key variables: export, import and FDI. Although we could speculate about the precise nature of these linkages, formulating six explicit hypotheses (about the sign and causality of each linkage), we decided not to do so, given the ambiguous evidence and lack of clear-cut theoretical predictions.

## **Methodology**

### **Granger-causality test**

One often applied method to investigate causal relationships between variables empirically is Granger-causality analysis. The basic principle of Granger-causality analysis (Granger, 1969) is to test whether or not lagged values of one variable help to improve the explanation of another variable from its own past. Simple Granger-causality tests are operated on a single equation in which variable *A* is explained by lagged values of variables *A* and *B*. It is then tested whether the coefficients of the lagged *B* variables are equal to zero. If the hypothesis that the coefficients of the lagged values of *B* are equal to zero is rejected, it is said that variable *B* Granger-causes variable *A*.

The present study will test for two-way Granger-causality relationships between exports, imports and FDI. So, a single-equation specification cannot fulfill the aim of this study. Instead, we set up a Vector AutoRegression (VAR) system,

which treats all variables symmetrically. In terms of the variables central to the present study, the VAR system has the following form:

$$EX_t = a_1 + \sum_{i=1}^n b_{1i} EX_{t-i} + \sum_{i=1}^n c_{1i} IM_{t-i} + \sum_{i=1}^n d_{1i} FDI_{t-i} + e_{1t}, \quad (1a)$$

$$IM_t = a_2 + \sum_{i=1}^n b_{2i} EX_{t-i} + \sum_{i=1}^n c_{2i} IM_{t-i} + \sum_{i=1}^n d_{2i} FDI_{t-i} + e_{2t}, \text{ and} \quad (1b)$$

$$FDI_t = a_3 + \sum_{i=1}^n b_{3i} EX_{t-i} + \sum_{i=1}^n c_{3i} IM_{t-i} + \sum_{i=1}^n d_{3i} FDI_{t-i} + e_{3t}, \quad (1c)$$

where  $EX$ ,  $IM$  and  $FDI$  are exports, imports and FDI, respectively;  $a$ ,  $b$ ,  $c$ , and  $d$  are parameters; the  $e$ 's are error terms; and  $n$  is the order of the VAR, *i.e.*, the maximum number of lags in the system. For the  $\{FDI_t\}$  sequence to be unaffected by exports, all the  $b_{3i}$  must be equal to zero; and for the  $\{FDI_t\}$  sequence to be unaffected by imports, all the  $c_{3i}$  must be equal to zero. Similar logic applies to  $\{EX_t\}$  and  $\{IM_t\}$ .

However, the conventional Granger-causality test based on a standard VAR-model is defined conditional on the assumption of stationarity. If the time series are non-stationary, the stability condition for VAR is not met, implying that the Wald test statistics for Granger-causality are invalid. In this case, the cointegration approach and vector error correction model (VECM) are recommended to investigate the relationships between non-stationary variables (e.g., Toda and Philips, 1993). Engle and Granger (1987) pointed out that when a linear combination of two or more non-stationary time series is stationary, then the stationary linear combination, the so-called the cointegrating equation, can be interpreted as a long-run equilibrium relationship between the variables.

## Cointegration approach

This long-run equilibrium relationship cannot determine the direction of causality, though. The direction can be obtained by estimating a VECM that explicitly includes the cointegrating relations. In a VECM, long and short-run parameters are separated, which gives an appropriate framework for assessing the validity of the long-run implications of a theory, as well as for estimating the dynamic processes involved. The short-run dynamics of the model are studied by analyzing how changes in each variable in a cointegrated system respond to the lagged residuals or errors from the cointegrating vectors and the lags of the changes of all variables. Therefore, by adopting of the cointegration approach and corresponding VECMs, we can detect both long-run and short-run relationships between non-stationary variables.

In the current study, we found two cointegration relationships between exports, imports and FDI (see below). Hence, we estimate the following three-equation VECM to analyse causality:

$$\Delta EX_t = \alpha_1 + \alpha_E ect_{t-1} + \sum_{i=1}^{n-1} \beta_{1i} \Delta EX_{t-i} + \sum_{i=1}^{n-1} \gamma_{1i} \Delta IM_{t-i} + \sum_{i=1}^{n-1} \delta_{1i} \Delta FDI_{t-i} + \theta_1 D_{92} + \varepsilon_{1t}, \quad (2a)$$

$$\Delta IM_t = \alpha_2 + \alpha_I ect_{t-1} + \sum_{i=1}^{n-1} \beta_{2i} \Delta EX_{t-i} + \sum_{i=1}^{n-1} \gamma_{2i} \Delta IM_{t-i} + \sum_{i=1}^{n-1} \delta_{2i} \Delta FDI_{t-i} + \theta_2 D_{92} + \varepsilon_{2t}, \quad (2b)$$

$$\Delta FDI_t = \alpha_3 + \alpha_F ect_{t-1} + \sum_{i=1}^{n-1} \beta_{3i} \Delta EX_{t-i} + \sum_{i=1}^{n-1} \gamma_{3i} \Delta IM_{t-i} + \sum_{i=1}^{n-1} \delta_{3i} \Delta FDI_{t-i} + \theta_3 D_{92} + \varepsilon_{3t}, \quad (2c)$$

where  $EX$ ,  $IM$  and  $FDI$  are first differences of  $EX$ ,  $IM$  and  $FDI$ , respectively; the error-correction term  $ect$  is a vector of residuals from the long-run equilibrium relationships;  $D_{92}$  is a step dummy variable, with zeros before and ones in and after 1992, to be discussed below;  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ , and  $\theta$  are parameters; and the  $\varepsilon$ 's are error terms.



Two aspects of the VECM system (2) deserve special attention. Firstly, the error-correction term consists of the linear combinations of our three variables, which are stationary. The number of combinations, also labeled as rank or the number of cointegration vectors ( $r$ ), is two in our case. Below, we will apply the Johansen cointegration test to determine the rank. The error-correction terms reveal the deviations from the long-run relationships between the three variables. The coefficients of  $ect$ ,  $\alpha_F$ ,  $\alpha_E$ , and  $\alpha_I$ , reflect the speed of adjustment of exports, imports and  $FDI$  toward the long-run equilibrium. For example, the larger the first (second) element of  $\alpha_F$ , the greater the response of  $FDI$  to the previous period's deviation from the first (second) long-run equilibrium relations. Conversely, if the two elements of  $\alpha_F$  are equal to zero,  $FDI$  does not respond to lagged deviations from the long-run equilibrium relationships. In this case,  $FDI$  is called weakly exogenous for the system. So, Granger-noncausality in case of cointegrated variables requires the additional condition that the speed-of-adjustment coefficients are equal to zero. For example, for the  $\{FDI_t\}$  sequence to be unaffected by exports, not only all the  $\beta_{3i}$  must be equal to zero, but also the elements of vector  $\alpha_F$ .

Secondly, three deterministic components – a constant, a trend and step dummy  $D_{92}$  – may enter the VECM system. The form in which the constant and the trend enter the VECM is found as part of the cointegration estimation strategy. The step dummy variable controls for the important role that the Chinese government policies have played in the process of China's integration into the world economy. China's liberalization policies followed a gradual step-by-step approach before 1992 (Zhang and van Witteloostuijn, 2004). In that period, international trade and FDI increased steadily. Since 1992, however, China has speeded up the pace of liberalization impressively. The Chinese trade system has been adapted to better

reflect international norms, and incentive measures have been launched to attract inward FDI. Consequently, China's FDI inflow has increased tremendously due to this changes in policies.

### **Estimation procedure**

Figure 4 (see below) indeed reveals a structural break in the FDI time series as of 1992. The Chow breakpoint test confirms that the influence of this break on the relationship between our time series is significant, with an F-statistic of 41.2 ( $p < 0.001$ ).<sup>3</sup> We considered three alternatives for the structural break: the break may change (1) the constant, (2) the trend, or (3) both the constant and the trend. We started from the most complicated case (3), including a step dummy ( $D_{92}$ ), the product term of  $D_{92}$  and  $EX$ , and the product term of  $D_{92}$  and  $IM$ . The result indicates that the coefficient of  $D_{92}$  is significant, but the two product terms are not, which implies that case (1) is empirically validated. Therefore, we only include the step dummy  $D_{92}$  into our VECM and cointegration test.

The estimation comes of three steps. First, we test whether the three variables involved are stationary with the Augmented Dickey-Fuller (ADF) unit root test. Additionally, due to the fact that there could be structural breaks in the time series concerned, we apply the Zivot-Andrews (1992) unit root test, which allows for one structural break in the time series. When the null hypothesis of non-stationarity is not rejected by these two tests, we move to the second step: the cointegration test in Johansen's (1991 & 1995) framework. If the first two steps indicate that the three variables are non-stationary and cointegrated, we take the third step: estimating the VECM of Equations (2), and testing for weak exogeneity and Granger-causality relationships between the three variables.

## **Data**

The current study examines the relationships between FDI inflows, exports and imports for China using annual data from 1980 to 2003. The three time series are deflated by using a GDP deflator, and are converted to constant US dollars (2000 = 100). All variables are transformed to natural logs before estimation. GDP deflators are obtained from the OECD (SourceOECD). Annual realized FDI values are collected from the Ministry of Commerce of the People's Republic of China (MOC) and the Chinese Ministry of Foreign Trade and Economic Cooperation (MOFTEC). Exports and imports information is from the Customs of General Administration of the People's Republic of China. Figure 4 shows exports, imports and FDI in logarithms from 1980 to 2003.

[INSERT FIGURE 4 ABOUT HERE]

Clearly, our three variables reveal an upward trend during the sample period. FDI increased faster than exports and imports did, however, especially in the 1992 – 1994 period.

## **Evidence**

### **Unit root tests**

Table 1 reports the results of the unit root tests for exports, imports and FDI using the ADF test.

[INSERT TABLE 1 ABOUT HERE]

Two models with different deterministic components are considered: the model with a constant only, and a model with a constant and a trend. It is clear that all the log-variables have a unit root in their levels. However, the null hypothesis of a unit root in first difference of the three variables is rejected at the 10 and 5%-level in the model

with a constant and a trend. Additionally, the hypothesis is rejected at the 5%-level for all variables in the model with a constant only. Therefore, according the ADF test we can treat exports, imports and FDI as integrated of order one in our sample, denoted  $I(1)$ .

The ADF test is biased toward accepting the null of non-stationarity if the time series has a structural break. Therefore, we apply the Zivot-Andrews unit root test. Table 2 shows the results. Again, the findings suggest that the three time series are  $I(1)$ . These results permit us to proceed with the next step, cointegration tests, in order to investigate the long-run relationships between exports, imports and FDI.

[INSERT TABLE 2 ABOUT HERE]

### **Cointegration test and long-run relationships**

The purpose of the cointegration test is to determine whether our three non-stationary time series are cointegrated – that is, to detect whether there are long-run equilibrium relationships among the three variables. As mentioned above, we include the step dummy  $D_{92}$  as an exogenous variable. We test for cointegration using the methodology developed by Johansen (1991 & 1995). We first need to find the optimal lag order for the VECM model. Lag-exclusion Wald tests indicate that three lags is the optimal lag structure in our VECM. With this optimum number of lags, we move on to choose the appropriate cointegration model for the constant and the trend. We estimated the five models considered by Johansen (1995: 80-84). The results indicate that a model with a linear trend and cointegrating equations with intercepts is supported. Therefore, we use this model to perform the cointegration test.

[INSERT TABLE 3 ABOUT HERE]

Table 3 reports the results of the cointegration test. Trace statistics and  $L$ -max statistics indicate that the null hypotheses of no cointegration,  $r=0$ , and one cointegration vector,  $r = 1$ , are rejected at the 1%-level. However, the null hypothesis of two cointegrating vectors,  $r = 2$ , is not rejected. Consequently, we conclude that there are two cointegrating relationships among the three selected variables in the model. Based on the normalization used in Table 3, the two cointegration vectors are

$$EX-1.97FDI+7.01, \text{ and} \quad (3)$$

$$IM-1.36FDI+1.28, \quad (4)$$

which are included in the *ect* term in the VECM system of Equation (2). The results indicate (a) a long-run positive relation between FDI and exports, and (b) a long-run positive relation between FDI and imports. These relationships imply that China's FDI inflow is positively associated with China's exports and imports in the long run. Combining Equations (3) and (4) yields the following positive relationship between *EX* and *IM*:

$$EX-1.45IM+5.16. \quad (5)$$

We must exercise caution, however, when interpreting this result. The reason is that, although the cointegration implies positive relations between the three variables, cointegration tests cannot determine the direction in which causality flows. The causality relationships can be ascertained from performing Granger-causality tests that incorporate the cointegrating relation. This is what we do next.

### **VECM and short-run relationships**

Given the existence of two cointegrating relationships between exports, imports and FDI, we test for weak exogeneity and Granger-causality by using the VECM of Equation (2).<sup>4</sup> In line with the outcomes of the cointegration test, the order of the

VECM is three, and a linear trend and cointegrating relations with constants are included in the model. Again,  $D_{92}$  is taken on board as an exogenous variable.

[INSERT TABLES 4 AND 5 ABOUT HERE]

Table 4 reports the results of the weak exogeneity test. Weak exogeneity is rejected for  $EX$  and  $FDI$  at the 1%-level. However, weak exogeneity is not rejected for  $IM$ . So, two of the three variables,  $EX$  and  $FDI$ , are weakly caused by each other. This conclusion is complemented by the result of the VECM Granger-causality test, as displayed in Table 5. The first column defines the equations of system (2). The other columns display  $\chi^2$  (Wald) statistics for the joint significance of each of the other lagged endogenous variables and the error-correction term in the associated equation. In the exports Equation (2a), the hypothesis that imports does not Granger-cause exports is rejected at the 1%-level, and the hypothesis that FDI does not Granger-cause exports is rejected at the 5%-level. In the imports Equation (2b), the hypothesis that exports does not Granger-cause imports cannot be rejected, and the hypothesis that FDI does not Granger-cause imports is not rejected either. In the FDI Equation (2c), the hypothesis that exports does not Granger-cause exports is rejected at the 5%-level, and the hypothesis that FDI does not Granger-causes imports is rejected at the 1%-level. In summary, the Wald test statistics indicate that bi-directional causal links in the short-run dynamics exist between  $\Delta EX$  and  $\Delta FDI$ , and that one-way causal links run from  $\Delta IM$  to  $\Delta FDI$  and from  $\Delta IM$  to  $\Delta EX$ .

## Conclusion

In this paper, we focused on analyzing three one or two-way relationships – between FDI and exports, FDI and imports, and exports and imports. In this context, we applied sophisticated econometric Granger-causality and cointegration techniques to

estimate both the causality and direction of potential linkages. Our empirical study confirms the interactive causality relationships between China's exports, imports and FDI, as summarized in Figure 5.

[INSERT FIGURE 5 ABOUT HERE]

Moving beyond previous studies, the present study finds evidence in support of more relationships between the three variables, although the findings are in line with that in the extant literature.<sup>5</sup> In the long run, FDI positively relates to exports and imports, and exports is positively associated with imports. This result implies that multinational enterprises' investments in China do not substitute for China's exports and imports. In the short run, the VECM framework reveals bi-directional causal links between FDI and exports, and one-way casual links from imports to FDI and from imports to exports.

First, the two-way causal link between exports and FDI suggests that growth of exports has made China more attractive to foreign investors, and foreign investment, in turn, has promoted China's exports. According to Kojima's (1975 & 1982) macroeconomic approach, export growth reveals a country's competitiveness in the world market. This competitiveness derives from the country's comparative advantages. The comparative advantages encourage multinational companies to invest in this country, so making use of these advantages to enhance their competitiveness in the world market. In the case of China, the growth of exports since 1978 has been four and a half times that of world exports, which demonstrates that China can benefit from noticeable comparative advantages. These advantages attract FDI into China that seeks low-cost production and raw-material access.

Given the nature of these types of FDI inflows, they, in turn, promote China's exports. This finding is consistent with the arguments of Vernon (1966), Ozawa (1992)

and Root (1977 & 1994). The casual link from FDI to export also reflects China's FDI policies, with an overall bias toward stimulating export-oriented FDI. That is, export-oriented foreign investments were (and still are) highly encouraged by the Chinese government through special tax rebates, low land-usage fees, and offering water, electricity and other infrastructure services. Furthermore, there were restrictions and regulations imposed on foreign invested enterprises (FIEs) in the area of export obligation. For example, under the Law of the People's Republic of China on Wholly-Owned Foreign Enterprises (1986, Article 3), FIEs have to export all or the majority of their products.<sup>6</sup> This is one of the reasons why FDI had a positive impact on exports in both the long run and the short run.

Second, the casual link from import to FDI found in our VECM cointegration test is in line with the internationalization argument advocated in the extant international business and international economics literatures (cf. Vernon, 1966). That is, multinational enterprises are likely to first penetrate a new market by using the exporting mode, to subsequently switch to FDI once they have established presence in that market.

Third, the lack of significance of causation from FDI to import can be explained by the contradictive impact of FDI on imports. On the one hand, FDI may replace import when the motivation for the investment is market-seeking. On the other hand, FDI might promote import when the motivation for foreign investment is factor-seeking. China is not only potentially the largest market in the world, but also features very low labor costs. Therefore, multinational companies may be driven by both motives, which causes opposing effects on import. As a result, empirical studies do not find clear-cut evidence for either a negative or a positive relationship. In a similar vein, Zhang and van Witteloostuijn (2004) found that the impact of FDI on



imports is less significant than the impact on exports, which is likely to be caused by the same reason.

In summary, the findings of this study indicate a virtuous process of the development of China's outward-oriented economy. As shown in Figure 5, more imports lead to more FDI, more FDI leads to more exports, and more exports lead to more FDI. This virtuous process reflects China's open-door policy. The trade liberalization program that started in 1978 initially facilitated China's imports, and hence, indirectly, FDI and exports. In order to fulfill its promise to the WTO, China is currently further opening up its markets to the outside world. This virtuous circle is therefore likely to continue, or even accelerate, which will eventually underpin a high economic growth rate in China for many years to come. In the process, the role of MNEs through FDI is crucial. It is precisely in this area that IB has an important contribution to make to extant knowledge, and hence to the ongoing globalization debate. The current study highlighted a particular macro-level issue – FDI – trade linkages – that is interesting from the perspective of evaluating the societal impact of MNE behavior. Future work may not only seek replication in different contexts and periods, but might also focus attention to other macro-level issues such as GDP growth and income inequality (cf. Meyer, 2004; Ramamurti, 2004).

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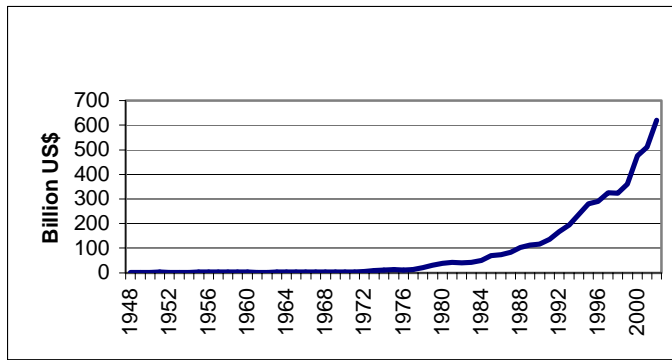
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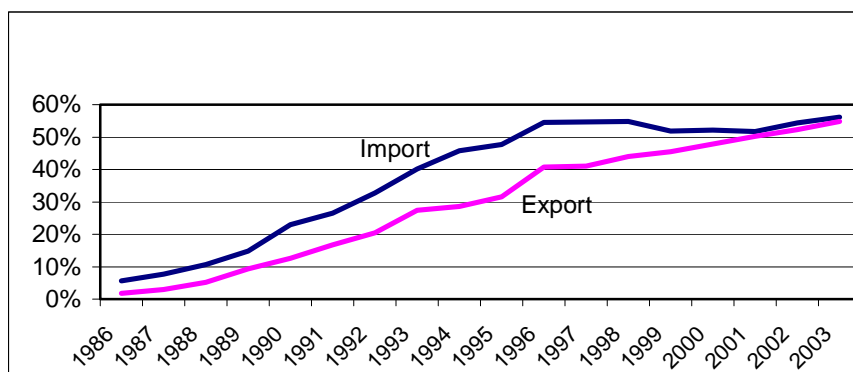
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**Figure 1.** China's foreign trade in the post-1949 era



Source: IMF DOTS databank.

**Figure 2.** FIEs share in China's trade



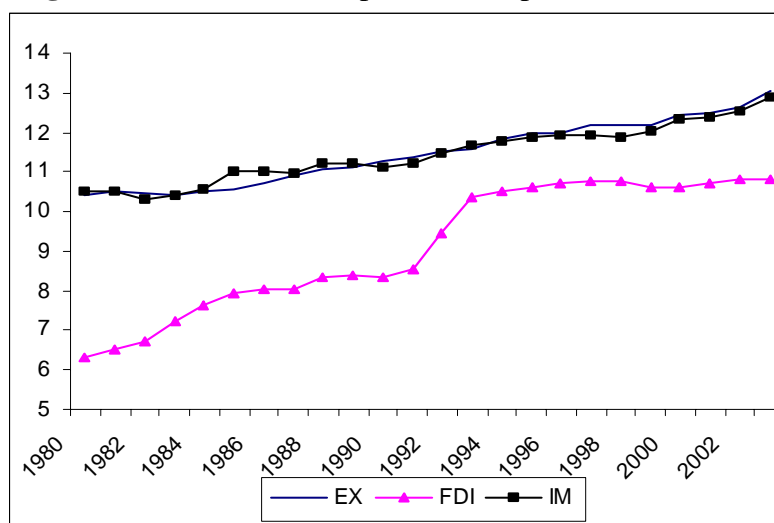
Source: Ministry of Commerce of the People's Republic of China.



**Figure 3.** Theoretical relations between import, export and FDI



**Figure 4.** China's FDI, exports and imports, 1980 – 2003



Note: FDI, EX and IM stand for logarithms of FDI, exports and imports, respectively.

**Table 1.** Augmented Dickey-Fuller unit root test

Variables	Level		First difference	
	With constant and trend	With constant only	With constant and trend	With constant only
<i>EX</i>	-2.723(2)	0.912(4)	-3.937**(0)	-3.303**(0)
<i>IM</i>	-3.120(3)	1.081(7)	-3.462*(5)	-3.398**(5)
<i>FDI</i>	-1.701(3)	-1.793 (3)	-3.722**(1)	-3.442**(1)

Notes:

- (1) *EX*, *IM* and *FDI* denote the logs of exports, imports and FDI, respectively.
- (2) \*\*, and \* are significant at the 5% and 10%-level, respectively.
- (3) Figures in parentheses are the number of lags that were selected by the Akaike Information Criterion (AIC).

**Table 2.** Zivot-Andrews unit root test: minimum t-statistic

	Level		First difference	
	With constant and trend	With constant only	With constant and trend	With constant only
<i>EX</i>	-2.093 (1994)	-2.093 (1994)	5.126 (1996)**	5.126 (1996)**
<i>IM</i>	-4.019 (1990)	-4.019 (1990)	4.800 (1989)	4.800 (1989)**
<i>FDI</i>	-4.567 (1992)	-4.567 (1992)	5.893(1992)***	5.893 (1992)***

Notes:

(1) *EX*, *IM* and *FDI* denote the logs of exports, imports and FDI, respectively.

(2) \*\*, and \* are significant at the 5% and 10%-levels, respectively.

(3) Figures in parentheses are break points.

**Table 3.** Johansen's cointegration tests (with three lags)

$H_0=r$	Eigenvalue	$\lambda_{\max}$	5% critical value	$\lambda_{\text{trace}}$	5% critical value
0	0.970	70.41***	21.13	102.53***	29.80
1	0.778	30.14***	14.26	32.12***	15.49
2	0.094	1.97	3.84	1.98	3.84
Normalized cointegrating coefficients (standard error in parentheses)					
One cointegrating equation: log-likelihood = 109.31.					
$\beta$	<i>EX</i>	<i>IM</i>	<i>FDI</i>	<i>c</i>	
	1.00	-1.06 (0.192)	-0.571 (0.073)	6.08	
Two cointegrating equations: log likelihood = 119.37.					
$\beta$	<i>EX</i>	<i>IM</i>	<i>FDI</i>	<i>c</i>	
	1.00	0.00	-1.97 (0.14)	7.01	
	0.00	1.00	-1.36 (0.10)	1.28	

Notes:

(1) \*\*\*, \*\*, and \* are significant at the 1%, 5% and 10%-level, respectively.

(2)  $D_{92}$  is included as an exogenous variable.

**Table 4.** Weak exogeneity test

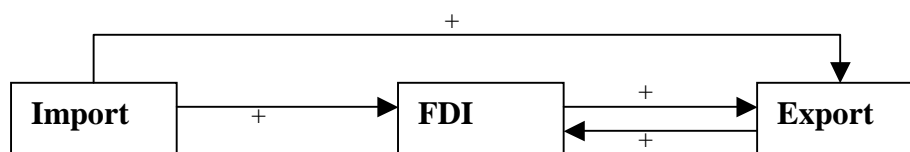
	$\chi^2$	p-value
$\Delta EX$ weakly exogenous to the system	21.00	0.0018
$\Delta IM$ weakly exogenous to the system	3.32	0.7678
$\Delta FDI$ weakly exogenous to the system	22.08	0.0012

**Table 5.** VECM Granger-causality test

Dependent variable	Wald test statistics ( $\chi^2$ )		
	$\Delta EX$	$\Delta IM$	$\Delta FDI$
$\Delta EX$		12.44***	9.95**
$\Delta IM$	1.52		1.20
$\Delta FDI$	15.37**	12.53***	

Note: \*\*\* and \*\* are significant at the 1% and 5%-level, respectively.

**Figure 5.** Estimated relations between FDI, exports and imports





## Notes

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<sup>1</sup> Law of the People's Republic of China on Chinese-Foreign Equity Joint Ventures (EJV Law, Article 4), Law of the People's Republic of China on Contractual Joint Ventures (CJV Law, Article 2), and Regulations for the Implementation of the Law of the People's Republic of China on Contractual Joint Ventures (CJV Implementation, Article 18).

<sup>2</sup> Another literature seeks to explain the impact of policy on FDI or trade (e.g., Globerman and Shapiro, 1999; Wilkinson and Brouthers, 2000).

<sup>3</sup> We also applied the Chow breakpoint test for other years, such as 1989, 1996 and 1994, as suggested in Table 2. However, these other step dummies are not associated with significant breaks.

<sup>4</sup> When variables are non-stationary at their levels but stationary at their first differences, some studies employ a vector autoregression (VAR) in first differences to detect the causality relation (e.g., Liu, Wang and Wei, 2001). However, when non-stationary variables are cointegrated, then a VAR in first differences is misspecified (Engle and Granger, 1987). In the current study, two cointegration vectors are found. Therefore, a VECM is used.

<sup>5</sup> Most studies concern to relationships between China's exports, imports and FDI. Wei (1999), Sun (2001), and Liu, Wang and Wei (2001) found only one-way relations between the three variables. Liu, Burridge and Sinclair (2002) traced a two-way relationship between FDI and export, and one-way linkages between FDI on the one hand and imports, imports and exports on the other hand.

<sup>6</sup> This restriction was relaxed in 2000, but the Chinese government still encourages FIEs to market their products outside of China.